

## Description

Cross-platform and data-specific visualization of 3D data records

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The invention relates to a device for cross-platform and data-specific visualization of 3D data records by means of visualization software for display on a 2D monitor.

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The brochure entitled "SIENET MagicView 300, Image Reporting, Image Processing and All That Goes With It" describes a viewer for visualizing 2D data records, as may be gathered from the first column on page 2. It is stated there that a digital image is defined as a matrix of discrete values that represent the gray-scale values. However, a matrix is always two-dimensional and does not represent a data volume such as is supplied, for example, as a 3D data record from the CT, MR or C-arm CT.

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Migration of 2D recordings to 3D volume data records leads to up the problem of having to exchange the volume data among doctors and of having to visualize them on different computers. In order to ensure uniform image quality, in addition to the medical data record it is necessary to make available a program that permits the visualization of the 3D data on the 2D monitor. The use of different methods for volume visualization together with the many possibilities for parameterizing the algorithms lead to a different image quality.

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To date, such volume data have mostly been exchanged by transmitting the volume data record via a DICOM interface to a medical workstation at which expensive volume visualization software is installed, although difficulties can occur in turn here as well when this

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volume visualization

software is not the same as that which was used on the original computer of the radiologist.

In addition, individual views of the volume data record  
5 have also been generated, stored in a standard image  
format and passed on. Images can be viewed on any  
desired PC with the aid of standard programs such as  
photoshop, for example. Finally, it has also already  
10 been proposed to store a number of fixed views in a set  
sequence as a digital video (avi, for example) and then  
play them back using standard software tools.

It is therefore the object of the invention to provide  
a device for cross-platform, data-specific  
15 visualization of 3D data records which, in conjunction  
with a simple design, operates independently of the  
computers respectively used and of any possible  
visualization software, and thereby permits 3D volume  
data records to be ordered and viewed by any desired  
20 third parties with the best play back quality.

To achieve this object, the invention provides that the  
3D volume data are stored together with visualization  
software on a data carrier, and the latter is  
25 transmitted to a user for play back on any desired PC.

Storing the 3D volume data record together with any  
(desired) visualization software means that 3D volume  
can be visualized on any PC without software  
30 additionally installed on said PC. Moreover, the unit  
of data record and visualization algorithm ensures that  
no general visualization tool with the aid of which any  
desired data records can be displayed is involved.

35 It can be provided here in a development of the  
invention that the visualization parameters are also  
stored on the data carrier in an

at least partially unchangeable fashion. This yields the advantageous possibility of, for example, making a 3D volume data record, produced by a radiologist and in which specific structures have been specially emphasized by specific visualization parameters, available to the operator in the operation room, in which case the latter then also sees precisely the structures that the radiologist has emphasized via the visualization parameters on the basis of his specialist knowledge. In many cases, it can be expedient precisely when transmitting such 3D data to less experienced doctors not to leave to the latter all the possibilities of selecting the various visualization parameters, since in most cases they are thereby completely overtaxed and, in the final analysis, are unable to extract any useful image at all from the data. Storing the 3D volume with visualization software and the visualization parameters found by the radiologist to be the best possible display of a specific structure on a data carrier, preferably a CD, renders it possible in a simple way to solve the problem of passing on such 3D volume data records among doctors in such a way that passing them on is very simple, that the receiver requires no special facilities (expensive visualization software on his work station), and that the data of the 3D volume data record that are of interest to the receiver can be passed on such that even a non-radiologist obtains an optimum display. Of course, even in such a case with fixed visualization parameters the operator still has the options of spatially rotating the 3D volume data record, for example with specially emphasized bone structures or else arborizations, and of regarding them from all possible points of view in order to prepare the operation.

Further advantages, features and details of the

invention emerge from the following description of an exemplary embodiment and with the aid of the drawing, which shows

schematically the projection of a 3D volume data record onto a 2D monitor.

When a 3D volume data record is being produced, the  
5 volume of interest is transirradiated from an optical  
center 1, and the points lying on the line of  
transirradiation are imaged in an image plane. A 3D  
volume data record can be calculated with the aid of an  
algorithm from a number of two-dimensional images  
10 produced from different optical centers 1. In the  
reconstruction, shown in the figure, of the 3D data  
record on a 2D monitor 2, the points lying on a  
projection ray 3 are added to the 3D volume V in  
accordance with variable points of view, specifically  
15 the so-called visualization parameters, for example  
with their gray-scale values, and imaged on the 2D  
monitor 2 as a pixel. The setting of the visualization  
parameters is a particularly difficult art in this case  
and is mastered only by experienced radiologists,  
20 whereas normal doctors are able only with great  
difficulty to emphasize the structures they desire from  
a 3D volume data record. For example, depending on the  
setting of the visualization parameters, vascular  
arborizations in the 3D volume V, for example, are  
25 specially emphasized, or else specific bone structures  
or other medical details. If these visualization  
parameters are recorded in common on a data record  
together with the visualization software respectively  
used and the 3D volume data by the recording  
30 radiologist, in particular burnt onto a CD, this data  
record can very easily be sent to a doctor or another  
department of a hospital where a simple PC requiring no  
special visualization installations of any sort, that  
is to say, in particular, on which there is no need to  
35 install any expensive visualization software, is  
sufficient for visualization. The simultaneous co-  
storage of the visualization parameters as far as

possible in a way such that the receiver is no longer capable of changing them has the advantage that even less experienced doctors can view on their simple PC with the best image quality precisely the structures emphasized by the radiologist.

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An exemplary scenario could look as follows in this case:

5 A neuroradiologist generates a three-dimensional volume  
data record with the aid of an angiography unit, edits  
the volume in such a way that an aneurism is  
effectively displayed, and burns a CD for the  
neurosurgeon. The latter takes the CD, plays it on a  
standard PC and can visualize and analyze the 3D data  
10 record directly. He is not dependent on a special work  
station, can inspect the data record on any desired  
computer, and can do so, moreover, with the same  
quality as his colleague in neuroradiology.